MAP2K2 gene

mitogen-activated protein kinase kinase 2

Normal Function

The *MAP2K2* gene provides instructions for making a protein known as MEK2 protein kinase. This protein is part of a signaling pathway called the RAS/MAPK pathway, which transmits chemical signals from outside the cell to the cell's nucleus. RAS/MAPK signaling helps control the growth and division (proliferation) of cells, the process by which cells mature to carry out specific functions (differentiation), cell movement, and the self-destruction of cells (apoptosis).

The *MAP2K2* gene is very similar to a gene called *MAP2K1*, which provides instructions for making a protein known as MEK1 protein kinase. Like MEK2 protein kinase, this protein functions as part of the RAS/MAPK signaling pathway. Together, the MEK1 and MEK2 protein kinases appear to be essential for normal development before birth and for survival after birth.

Health Conditions Related to Genetic Changes

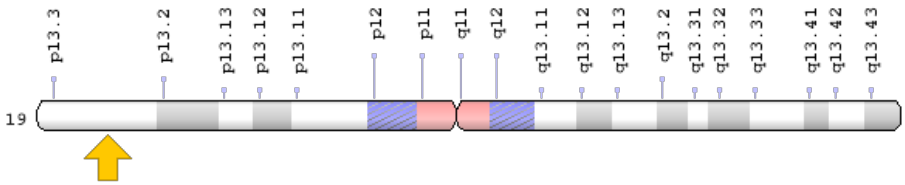
cardiofaciocutaneous syndrome

At least 13 mutations in the *MAP2K2* gene have been identified in people with cardiofaciocutaneous syndrome. Most of these mutations change single protein building blocks (amino acids) in MEK2 protein kinase, although one mutation deletes several amino acids from the protein. These genetic changes abnormally activate MEK2 kinase, which disrupts the tightly regulated RAS/MAPK signaling pathway in cells throughout the body. The altered signaling interferes with the normal development of many organs and tissues, resulting in the characteristic features of cardiofaciocutaneous syndrome.

Chromosomal Location

Cytogenetic Location: 19p13.3, which is the short (p) arm of chromosome 19 at position 13.3

Molecular Location: base pairs 4,090,321 to 4,124,184 on chromosome 19 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- dual specificity mitogen-activated protein kinase kinase 2
- ERK activator kinase 2
- MAP kinase kinase 2
- MAPK-ERK Kinase 2
- MAPK/ERK kinase 2
- MAPKK2
- MEK2
- mitogen-activated protein kinase kinase 2, p45
- MKK2
- MP2K2_HUMAN
- PRKMK2

Additional Information & Resources

Educational Resources

- The Cell: A Molecular Approach (second edition, 2000): Ras, Raf, and the MAP Kinase Pathway
  https://www.ncbi.nlm.nih.gov/books/NBK9870/#A2252

GeneReviews

- Cardiofaciocutaneous Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK1186

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28MAP2K2%5BTIAB%5D%29+OR+%28mitogen-activated+protein+kinase+kinase+2%5BTIAB%5D%29%29+OR+%28%28MAPKK2%5BTIAB%5D%29+OR+%28MEK2%5BTIAB%5D%29+OR+%28MKK2%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

OMIM

- MITOGEN-ACTIVATED PROTEIN KINASE KINASE 2
  http://omim.org/entry/601263

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_MAP2K2.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=MAP2K2%5Bgene%5D
- HGNC Gene Family: Mitogen-activated protein kinase kinases
  http://www.genenames.org/cgi-bin/genefamilies/set/653
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=6842
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/5605
- UniProt
  http://www.uniprot.org/uniprot/P36507

Sources for This Summary

- Duesbery N, Vande Woude G. BRAF and MEK mutations make a late entrance. Sci STKE. 2006 Mar 28;2006(328):pe15.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16569817
- Narumi Y, Aoki Y, Niihori T, Neri G, Cavé H, Verloes A, Nava C, Kavamura MI, Okamoto N, Kurosawa K, Hennekam RC, Wilson LC, Gillessen-Kaesbach G, Wieczorek D, Lapunzina P, Ohashi H, Makita Y, Kondo I, Tsuchiya S, Ito E, Sameshima K, Kato K, Kure S, Matsubara Y. Molecular and clinical characterization of cardio-facio-cutaneous (CFC) syndrome: overlapping clinical manifestations with Costello syndrome. Am J Med Genet A. 2007 Apr 15;143A(8):799-807.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17366577
- Nava C, Hanna N, Michot C, Pereira S, Pouvreau N, Niihori T, Aoki Y, Matsubara Y, Arveiler B, Lacombe D, Pasmant E, Parfait B, Baumann C, Héron D, Sigaudy S, Toutain A, Rio M, Goldenberg A, Leheup B, Verloes A, Cavé H. Cardio-facio-cutaneous and Noonan syndromes due to mutations in the RAS/MAPK signalling pathway: genotype-phenotype relationships and overlap with Costello syndrome. J Med Genet. 2007 Dec;44(12):763-71. Epub 2007 Aug 17.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17704260
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2652823/
- Rodriguez-Viciana P, Tetsu O, Tidyman WE, Estep AL, Conger BA, Cruz MS, McCormick F, Rauen KA. Germline mutations in genes within the MAPK pathway cause cardio-facio-cutaneous syndrome. Science. 2006 Mar 3;311(5765):1287-90. Epub 2006 Jan 26.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16439621
- Scholl FA, Dumesic PA, Barragan DI, Harada K, Bissonauth V, Charron J, Khavari PA. Mek1/2 MAPK kinases are essential for Mammalian development, homeostasis, and Raf-induced hyperplasia. Dev Cell. 2007 Apr;12(4):615-29.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17419998

Reprinted from Genetics Home Reference:
https://ghr.nlm.nih.gov/gene/MAP2K2

Reviewed: May 2012
Published: March 21, 2017

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services